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WATERSHED PLAN FOR PAW PAW BOTTOMS WATERSHED SEQUOYAH COUNTY, OKLAHOMA



PREPARED UNDER THE AUTHORITY OF THE WATERSHED PROTECTION
AND FLOOD PREVENTION ACT
(PUBLIC LAW 566, 83rd CONGRESS, 68 STAT. 666), AS AMENDED

Paw Paw Conservancy District
Sequoyah County Conservation District
Cherokee Hills Resource Conservation and Development Project
Inc.

SEPTEMBER 1979

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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PAW PAW BOTTOMS WATERSHED
Sequoyah County, Oklahoma

WATERSHED PLAN

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PAW PAW BOTTOMS WATERSHED PLAN^{1/}

Sequoyah County, Oklahoma

INTRODUCTION

The watershed plan for Paw Paw Bottoms, developed by local sponsors with the assistance of the U.S. Department of Agriculture Soil Conservation Service (SCS), provides the basis for authorizing federal assistance for implementation under the authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended (16 USC 1001-1008).

The sponsoring local organizations which developed the plan are:

Paw Paw Bottoms Conservancy District

Sequoyah County Conservation District

Cherokee Hills Resource Conservation and Development Project, Inc.

Financial assistance for plan development was provided by the Oklahoma Conservation Commission. Other federal, state, and local agencies participated in planning.

In accordance with Section 102(2)(C) of the National Environmental Policy Act of 1969, Public Law 91-190, as amended (42 USC 4321 et seq) and environmental impact statement has been prepared as a separate document. Responsibility for compliance with the National Environmental Policy Act rests with the Soil Conservation Service.

PROJECT SETTING

The watershed encompasses 4,463 acres and is located near Sallisaw, Oklahoma in Sequoyah County. The problem area, know locally as Paw Paw Bottoms, is an alluvial containing 4,030 acres. This alluvial area is mildly to moderately undulating, and was formed by deposition along meander patterns of the Arkansas River. The land form appears as a series of half-moon ridges and depressions along the old meander patterns of the river. These undulations become broader and less pronounced from the river to the hills. The land slopes from the river to the hills and along the river. The natural drainage within the

^{1/}All information and data, except as otherwise note, were collected during watershed planning investigations by the Soil Conservation Service, USDA.

alluvium is from the river toward the broader depressional areas nearer the hills and through Camp Creek (a shallow back-swamp channel) to the lower end of the watershed area where the water discharges into the Arkansas River.

The higher natural levees were cleared for farming about the turn of the century. Ditches were dug by hand to drain the higher positioned depressions into the lower depressions. As time passed, and the need for agricultural products grew, more of the alluvium was cleared and additional ditches were cut to drain the land. About 3,000 acres of the 4,030 acres alluvial portion of the Paw Paw Bottoms watershed area is prime farmland.

The Paw Paw Bottoms are now used mainly for crops (3,665 acres) with small areas used for improved pasture (259 acres), range (12 acres), forest (52 acres), and miscellaneous (42 acres). Interspersed within these uses are two small waterholes of less than one acre each and narrow strips of weeds, brush, and trees along ditch banks and in odd corners. There is a depression of about 40 acres at the northern edge of the watershed that is classified by the U.S. Fish and Wildlife Service as Type 6 2/ wetland. This area supports a growth of young willows and water meadow grasses. It is covered with water when flow in Camp Creek is high during periods of prolonged rainfall in the winter and spring months. When water levels in Camp Creek are down during the late spring, summer, and fall months, water drains from the depression. It provides a resting and feeding place for waterfowl when covered with water and it is used for pasture or range when dry. There are about 40 acres of bottomland hardwood in a band near the center of the watershed, about a mile west of the wetland area.

Camp Creek is a natural channel in the back water depression. Flow is ephemeral, occurring only during and immediately after periods of excessive rainfall. The channel holds water only when the water level of the Arkansas River is high. All other channels are manmade and normally dry.

The soils in this area have developed in alluvium from the Arkansas River. The surface textures range from fine sand to clay. The sub-soils have similar texture ranges and are very slowly permeable to rapidly permeable.

The general topography of the area is level or nearly level; however, short, irregular slopes up to 3 percent occur adjacent to sloughs. The surface drainage is slow or non-existent. Ponded areas occur in small irregular patterns throughout the project area.

2/Wetlands of the United States by S. P. Shaw and C. G. Fredline,
U.S. Fish and Wildlife Circular 39.

These soils were once subject to occasional flooding by the Arkansas River, but the flood control and navigation project on the river, has essentially eliminated flooding from this source.

Appendix B gives a general description of the soils in the project area. Complete soils information is available in a published Soils Survey for Sequoyah County.

Surveys made by professional archeologists and historians have been reviewed by the state historic preservation officer and the state archeologist. They have identified no archeological or historical values eligible for inclusion in the National Register of Historic Places that would be impacted by installation of the planned measures.

No threatened or endangered species of plants or animals are known to inhabit the watershed.

The present channel system is inadequate to remove the excessive rainfall from the alluvium. About 436 acres of hill land sheds runoff onto the alluvium. About 1,600 acres, within and adjacent to the depressions, have limited permeability and an insufficient outlet for surface drainage, making crops on these areas subject to flood damage during the average year. Since most of the areas with flooding and drainage problems occur in strips, cultivation of all of the alluvium is hampered.

PROJECT FORMULATION

This project was planned for flood prevention and agricultural land drainage. The watershed problems were determined through the sponsors, public meetings, and inventory and evaluation.

PROJECT GOALS

Two broad objectives, national economic development (NED) and environmental quality (EQ), guided the planning of this project. The NED objective advocates increasing the value of the nation's output of goods and services or improving economic efficiency. The EQ objective promotes the conservation and/or preservation of such nonmonetary aspects of man's surroundings as cultural resources, ecological systems, and quality of the nonrenewable natural resource base.

The objectives of the sponsors are to improve the quality of the human environment by providing attractive, convenient, and satisfying places to live, work, and play and to improve the quality in the standard of living based upon community improvement.

Within the framework of these broad objectives, the following goals were agreed upon by the sponsors and the Soil Conservation Service:

National Economic Development

Increase the value of output of goods and services through:

- (a) Flood prevention - Provide a 3-4 year level of protection for 1,600 acres of problem area.
- (b) Drainage - Provide for soil profile drainage by removing about 2-4 inches of runoff in 24 hours for the 1,600 acre problem area.

Environmental Quality

- (a) Avoid disturbing the 40 acres of Type 6 wetland.
- (b) Avoid damage to archeological or historical resources eligible for inclusion in the National Register of Historic Places, should any be discovered during project installation.
- (c) Avoid disturbance of any endangered or threatened species of plant or animal, should any be discovered during project installation.
- (d) Minimize irreversible and irretrievable commitments of resources in satisfying goals.

ALTERNATIVES

Alternatives which satisfied one or more of the project goals were considered. The preservation of the 40 acres of wetland was placed as a constraint on all alternatives. Plans which emphasized either national economic development (NED) or environmental quality (EQ) only were not studied in detail. It was determined early in the planning process that a plan could be developed which would satisfy both economic and environmental goals.

Structural

A number of prospective channel work alternatives were studied for their impact on the economic and environmental goals. The selected plan, as described in the "Planned Project" section, included structural measures which satisfied the economic goals without adversely effecting environmental values.

Non-Structural

A non-structural alternative involving use of the higher natural levees for crops, the areas with moderate flood and drainage problems for pasture and hayland, and the areas with most severe flood and drainage problems as a natural wildlife area was considered by the planners.

This alternative action would avoid all of the adverse effects of the selected plan. Because of the undulations of the land, areas with few, moderate, and severe flood and drainage problems are in narrow bands. Implementation of the described use pattern would drastically reduce net monetary return and is unacceptable to the sponsors.

No Project

It is anticipated that future conditions without the installation of the planned project will remain much as they are today. The productivity of the alluvium is such that the operators will continue farming in the area, taking losses as they come. These losses are associated with the flooding and drainage problems and include increased costs of operating farm machinery on wet land, decreased yields due to late plantings and retarded plant growth, increased costs associated with the need to plant twice or more, and damage to growing and mature crops. Prices for agricultural products are not anticipated to reach a level in the foreseeable future which will permit conventional financing to install the needed channel work. Both the adverse and positive effects of this project could be avoided through no action.

PLAN SELECTION

The selected plan is an alternative which is acceptable to both the sponsors and the SCS. The selected channel size was based on an analysis which determined the removal rate which would provide the greatest net economic benefits. The selected plan presents no conflicts with economic or environmental goals.

PLANNED PROJECT

The planned project consists of 8.13 miles of channel work and the continuation of the going land treatment program. The project is to be installed over a 2-year period.

LAND TREATMENT

The present land treatment program is well adapted to the conservation needs of the area. Since no special land treatment needs were identified in the watershed area, a continuation of the present program will satisfy the project goals.

About 45,000 feet of onfarm drainage systems and 40 acres of land clearing will result from the installation of the channel. The onfarm drainage measures include surface drainage ditches which will be installed on individual farms and used to move surface water into the main and lateral ditches. These associated drainage measures are interrelated to the channel and are needed to assure realization of benefits from project measures. The land clearing will attribute benefits to the project measures based on more intensive use of the land.

All land treatment measures will be installed voluntarily by the individual land owner or operator. Although cost sharing is normally available for installation of some land treatment measures, no cost sharing assistance is presently available for onfarm drainage systems or land clearing. Technical assistance to aid in installation, application, or maintenance of land treatment measures is provided by various federal agencies, including the Soil Conservation Service, the Agricultural Stabilization and Conservation Service, and the U.S. Forest Service through their going program with the State Forestry Division.

STRUCTURAL MEASURES

The planned structural measures involve 8.13 miles of channel work (see project map) and three grade control structures. The channels will be trapezoidal in shape. Bottom widths of the channels will range from 4 feet to 24 feet, depths of flow from 1.2 feet to 4.7 feet, and depths of excavation from 0 to 8.0 feet. The channels will have 1.5:1 (one foot vertical to 1.5 feet horizontal) side slopes with the exception of the upper end of lateral 2C which will have 8:1 side slopes. Spoil materials from channel excavation will be spread adjacent to the channel. Travelways for maintenance will be located on both sides of the channel, on the spoil bank or on a county road if present, or on a designated area adjacent to the channel.

Three grade control structures will be installed to stabilize grade. Corrugated metal pipe drop structures will be installed at the end of the south main, and at the outlets of laterals 2A and 2C.

Local sponsors will install bridges at road crossings as specified in the final design. Side inlets will be installed as a part of the channel work to permit entrance of water from small side laterals without damage to the channel.

All channels will serve both flood prevention and drainage purposes. Each channel and appurtenant structures have been planned to serve more than one landowner and no ditch was planned for the primary purpose of bringing new land into agricultural production.

COSTS

The total installation cost of the project is estimated to be \$384,600. Included in the total installation costs are \$52,400 for land treatment, \$289,700 for structural measures, and \$42,500 for project administration. Tables 1 and 2 gives a further breakdown of the installation costs. The Agreement (See Appendix A) shows the actual cost sharing between Public Law 566 funds and other funds.

The total cost for the land treatment program is \$52,400. This includes \$2,500 for technical assistance, \$44,900 for the installation of associated onfarm drainage systems, and \$5,000 for land clearing.

The estimated installation cost of structural measures is \$289,700. Included in the total structural measures costs are \$189,400 for construction, \$20,500 for engineering, and \$79,800 for landrights (See Table 2). The cost of engineering services includes the direct cost of engineers and other technicians for survey investigation, design, and preparation of plans and specifications for structural measures. Included in landrights costs are \$60,000 for rights-of-way and \$19,800 for the modification of three county bridges.

Project administration costs are estimated to be \$42,500. Included in project administration costs are \$20,500 for construction inspection and \$22,000 for other administrative costs associated with the installation of structural measures such as cost for contract administration and government representatives. These costs are treated as project costs but are not considered applicable to individual purposes served by the project, nor are they a part of the cost of individual measures.

All structural measures are planned to serve two purposes, flood prevention and drainage. Costs for all structural measures are allocated to purposes based on an areal relationship of wet and nonwet land in the watershed. That portion of the cost of channel improvement which is allocated to flood prevention is equal to the ratio of the area of nonwet land to the area of the entire watershed. The remainder of the cost is allocated to drainage. This method results in allocating 70.7 percent of the cost to flood prevention and 29.3 percent to drainage.

ECONOMIC BENEFITS

Agricultural benefits are based on a reduction in damages through flood prevention and an increase in production through drainage. The implementation of the selected plan will provide agricultural benefits on 1,310 acres for approximately 19 landowners. The works of improvement will remove an estimated 2.34 inches of runoff within 24 hours. This will provide an estimated 3-year level of protection. Different removal rates were analyzed to determine the rate that would provide the greatest net benefit. The analysis showed that the greatest net benefit would be provided by removing 2.34 to 3.05 inches of runoff per 24 hours. Storms with less than 2.34 inches of runoff per event, produce about 89 percent of the total volume of annual runoff (exclusive of quick return flow). The proposed works of improvement will allow for the removal of that amount within 24 hours. Protection for varying acreages of the problem area were also analyzed. The greatest net benefit is produced by providing outlets for the entire 1,600 acres of problem area and removing 2.34 to 3.05 inches of runoff per 24 hours. Protection for the entire problem area would yield an additional \$14,580 of annual benefits and drain 40 acres of Type 6 wetlands.

Agricultural benefits are based on a reduction in damages through flood prevention and an increase in production through drainage. The implementation of the selected plan will directly benefit 1,310 acres and approximately 19 landowners. An improvement in farming efficiency will occur for an additional 2,400 acres.

About 59 percent of the problem area is double-cropped with wheat and soybeans. Average yields are 13 and 18 bushels per acre, respectively. It is expected that these yields will increase to 24 and 31 bushels respectively with the removal of 2.34 inches of runoff in 24 hours.

The increase in net income resulting from the proposed project is expected to average \$65,865 annually. These benefits are exclusive of the effects of land treatment. The increase in net income is based on the appropriately discounted difference between the future conditions without the project and the future conditions with the project. The increase in taxes, overhead, and the increase in potential flood damages due to increased values per acre have been deducted. Benefits were also discounted for the estimated rate of farmer participation. Associated costs for onfarm drainage measures are estimated to be \$4,060 annually. This includes \$3,200 for onfarm drainage ditches, \$360 for land clearing, and \$500 for operation and maintenance. Table 1 displays the installation costs for onfarm drainage measures. The structural works of improvement will provide an estimated \$65,865 in average annual benefits of which \$46,545 are damage reduction and \$19,320 are agricultural water management. Average annual costs are estimated to be \$24,840 providing a benefit-cost ratio of 2.7:1.

INSTALLATION AND FINANCING

All works of improvement will be installed in accordance with applicable state and federal regulations. A federal inspector will be on site to monitor installation activities.

Equipment will not be allowed to operate when conditions are such that soil erosion or water, air, and/or noise pollution cannot be satisfactorily controlled. Guidelines for minimizing soil erosion and water and air pollution will be adhered to during construction. Erosion control measures will be applied promptly on excavated areas, spoil, and disturbed areas. Work will be completed as rapidly as possible to facilitate and accelerate temporary and permanent vegetation and other pollution abatement measures. Disposal of clearing wastes and construction debris will be accomplished by burying or burning. Burning, if required, will be conducted in accordance with the regulations adopted by the Oklahoma State Board of Health, and referred to as "Regulation No. 1", Prohibition of Open Burning. Acceptable means of disposal of pollutants such as fuel, lubricants, and chemicals used in construction operations will be provided. Sanitary facilities meeting state and federal health and safety requirements for disposal of sewage will be provided during construction.

The channels will be excavated from one side when necessary to avoid disturbance of woody vegetation. Spoils will be placed to avoid damage to vegetation, smoothed, and planted to grasses, shrubs, and plants chosen first to control erosion, second for wildlife food and cover, and third for screening and aesthetic value. Construction will be scheduled to permit the channel, the spoil, and the travelway disturbed

by construction machinery to be seeded at the end of each day's work. Permanent plantings will be installed as segments of work are completed. It is estimated that about 30 acres of vegetative plantings will be installed adjacent to the channels through this process. These 30 acres will replace 7 acres of woody vegetation removed during construction and 23 acres of cropland adjacent to the existing channel.

The channel work will be performed under a formal contract administered by the Soil Conservation Service. The SCS will also prepare final construction plans and specifications, contract payment estimates, make construction inspections, prepare certificates of completion, and perform other related engineering and administrative tasks.

Public Law 566 funds will provide the federal share of the construction cost and all installation service costs incurred by the Soil Conservation Service. Federal assistance will be provided under the authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, 68 Statute 666), as amended. This assistance is subject to appropriation of funds.

The associated onfarm measures will be installed by landowners and operators. Technical assistance for planning and installing these measures will be provided through the Sequoyah County Conservation District.

The Paw Paw Conservancy District has the necessary authority to discharge local responsibilities associated with installation of the channel. Although the conservancy district has acquired through donation all necessary land to install the proposed channel, it has the power of eminent domain and will use it, if necessary, to obtain additional land-rights if required. The conservancy district has the power under state law to secure and repay loans, assess benefits, and levy taxes. Funds for the repayment of loans and for operation and maintenance costs will be obtained from taxes levied on the benefited area.

A survey of the proposed impact area indicated that no archeological or historical resources would be affected by the work; however, if archeology resources are discovered during construction, the Soil Conservation Service will notify the state historic preservation officer and the Heritage Conservation and Recreation Service. Archeological resources discovered during construction will be handled in accordance with procedures established in published Soil Conservation Service Guidelines, 7 CFR, Part 656. Since this is a federally-assisted project, there will be no change in existing responsibilities of any federal agency under Executive Order 11593 with respect to archeological and historic resources.

Installation of structural measures will be contingent upon all land rights having been obtained, project agreements having been executed, and the operation and maintenance agreement having been executed.

OPERATION, MAINTENANCE, AND REPLACEMENT

The Paw Paw Conservancy District will be responsible for the operation and maintenance of the proposed channel work. The estimated annual operation and maintenance cost of \$1,150 will be provided by the Paw Paw Conservancy District. The proposed works of improvement include 8.13 miles of channel and appurtenances. Inspection of the channel work will be made annually by the Paw Paw Conservancy District and the Soil Conservation Service for a period of 3 years. Annual inspection after the third year will be made by the Paw Paw Conservancy District. Inspection reports will be supplied to the Soil Conservation Service following each inspection. Upon request, the Sequoyah County Conservation District will provide technical assistance for needed maintenance work. Items of inspection will include: (1) degree of channel filling and/or scour; (2) bank erosion; (3) obstruction of flow; (4) vegetative growth along and within the drainage ditch; (5) deterioration of short life items such as corrugated metal pipe (CMP); and (6) any associated needs pertinent to proper functioning of the channel work.

Items of operation, maintenance, and replacement to be performed will consist of but not be limited to:

1. Removal of obstructions to flow in the channel can include removal of vegetative growth (within the wetted perimeter of the channel) by hand, by mowing, or other acceptable methods. The sponsors and the SCS will jointly determine when sediment needs to be removed. During removal of sediment, care will be taken to preserve the integrity of the original plan and the provisions for protecting the wildlife and other related resources.
2. Correction of bank erosion or unstable outlets will be accomplished using accepted methods of grade stabilization and critical area treatment.
3. Replacement of corrugated metal pipe, etc.

The SCS agrees to provide technical assistance to the sponsors on operation and maintenance of the channel work.

The sponsors recognize and understand their responsibilities in the operation and maintenance of the channel work.

An operation and maintenance agreement will be executed between the Paw Paw Conservancy District (sponsors) and the Soil Conservation Service (SCS) prior to signing a landrights, relocation, or project agreement.

This agreement will contain specific sponsor responsibilities for nonstructural and structural project measures and specific provisions for retention, use, and disposal of property acquired or improved with PL 566 cost-sharing.

PROJECT IMPACTS

A broad range of environmental, economic, and social factors were considered during the environmental assessment. An environmental impact statement has been prepared as a separate document for this project.

The following factors were evaluated in the environmental assessment of this project:

- erosion and sedimentation
- flooding
- drainage
- ground water (water table)
- wetlands
- bottomland hardwood
- ephemeral streams
- archeological and historical resources
- rare or endangered animals and plants
- water quality
- water quantity
- appearance of landscape
- economic impact
- social impact
- prime and unique farmland

Impacts of installation of the channels on these factors were found to be measurable in flooding and drainage of bottomland hardwoods, and the effect on prime farmland. These and other items of wide public interest are discussed below.

Although all reasonable precautions will be taken during construction, a temporary increase in erosion and sedimentation will result during installation of the channels and for a part of the following growing season.

The channel work will improve drainage and reduce flooding directly on about 1,300 acres of land, make possible conservation use of about 1,000 acres of contiguous land and in total contribute to more efficient use of about 3,000 acres of prime farmland. About 40 acres of bottomland hardwood in a band near the center of the alluvium will be susceptible to clearing when the channel work is in place.

The objective to improve drainage and reduce flooding on 1,600 acres was reduced to about 1,300 acres to protect 40 acres of Type 6 wetlands which are not associated with the 40 acres of bottomland hardwood. The protection of these wetlands reduced the benefited area from 1,600 to about 1,300 acres.

About 35 acres of land will be committed to channels of which approximately 28 acres will provide moderate value wildlife habitat along the constructed channels.

Production will be increased about 75 percent on approximately 1,300 acres of cropland and pastureland through improved soil drainage and reduced flooding. An improvement in farming efficiency will occur on an additional 2,400 acres of farmland.

The 40 acres of Type 6 wetland in this measure area will not be compromised. No known historical or archeological values will be impacted. No rare or threatened plant or animal species will be impacted.

ADVERSE ENVIRONMENTAL IMPACTS

The adverse effects that cannot be avoided are limited to the temporary increase in erosion and sedimentation during the construction and for a year thereafter and to the establishment of conditions favorable to the clearing of about 40 acres of bottomland hardwoods.

RELATIONSHIPS TO LAND USE PLANS, POLICIES, AND CONTROLS

The Paw Paw Bottoms flood prevention and drainage project was originally planned as a Resource Conservation and Development (RC&D) measure. It was proposed by the Sequoyah County Conservation District Supervisors and adopted as a part of the Cherokee Hills RC&D Project Plan by the Cherokee Hills RC&D Executive Council in September 1975. The proposed project does not conflict with the objectives or the specific terms of approved or proposed federal, state, or local land use policies, plans, or controls.

Several segments of a coordinated plan, including reservoirs for flood control, water supply, power generation, recreation, and navigation works have been installed on the Arkansas River. The Paw Paw Bottoms Watershed Plan is consistent with the coordinated plan and will provide a significant increment of additional protection for the Paw Paw Bottoms.

There are several other Public Law 566 watershed projects within the vicinity of the Paw Paw Bottoms Watershed in various stages of completion. These watershed projects will also provide additional flood control for the local area and the mainstem of the Arkansas River located downstream, of which the Paw Paw Bottoms are a part.

CONSULTATION

The local sponsors requested assistance to solve drainage and flood problems in the Paw Paw Bottoms watershed in September 1975. A proposal was reviewed and adopted by the Cherokee Hills RC&D Executive Council in September 1975. The Paw Paw Conservancy District was legally formed on September 22, 1977. Due to federal funding constraints on the RC&D program, the proposed plan could not be implemented as scheduled. In view of this the sponsors made application to the Oklahoma Conservation Commission for assistance under the authority of Public Law 83-566. The application was approved and a planning priority was issued in March 1979. The Administrator of the Soil Conservation Service authorized planning assistance with PL 566 funds in June 1979.

The Soil Conservation Service, the U.S. Fish and Wildlife Service, Oklahoma Department of Wildlife Conservation, U.S. Army Corps of Engineers, state agencies, and the Sequoyah County Commissioners have either participated actively in planning or provided information. A consulting archeologist made an on-site investigation to determine if archeological or historical resources would be impacted. The consulting archeologist reported no significant findings.

An interdisciplinary team developed the project plan. Three public meetings were held. The first was on December 9, 1975, at Muldrow, Oklahoma, and the latest was held on April 11, 1977, also at Muldrow.

The sponsors reviewed the work of the technical specialists at the April meeting and adopted the proposed plan. No controversy or apparent opposition has been raised during the development of the plan.

TABLES FOR PLANNED PROJECT

- Table 1 - Estimated Installation Costs
- Table 2 - Estimated Structure Cost Distribution
- Table 2A - Cost Allocation and Cost Sharing Summary
- Table 3 - Structural Data, Channel Work
- Table 3A - Structural Data, Grade Stabilization Structures
- Table 4 - Annual Costs
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- Table 6 - Comparison of Benefits and Costs

TABLE 1 - ESTIMATED INSTALLATION COSTS
PAW PAW BOTTOMS WATERSHED PLAN

| | | ESTIMATED COST (DOLLARS) 1/ | | | | | | | |
|--|-------|-----------------------------|---------|-----------|---------|-----------|------|-------|---------|
| | | PUBLIC LAW 566 FUNDS : | | | OTHER : | | | | |
| | | NON-FED : | | NON-FED : | | NON-FED : | | | |
| INSTALLATION COST ITEM | UNIT | NUMBER | LAND | TOTAL | LAND | TOTAL | LAND | TOTAL | TOTAL |
| LAND TREATMENT-GOING PROGRAM | | | | | | | | | |
| Associated Onfarm | | | | | | | | | |
| Drainage Measures | Feet | 45,000 | - | - | 44,900 | 44,900 | | | 44,900 |
| Land Clearing | Acre | 40 | - | - | 5,000 | 5,000 | | | 5,000 |
| Technical Assistance | | | - | - | 2,500 | 2,500 | | | 2,500 |
| TOTAL LAND TREATMENT | | | - | - | 52,400 | 52,400 | | | 52,400 |
| STRUCTURAL MEASURES | | | | | | | | | |
| Channel Work 2/ | Miles | 8.13 | 182,100 | 182,100 | 107,600 | 107,600 | | | 289,700 |
| SUBTOTAL STRUCTURAL COST | | | 182,100 | 182,100 | 107,600 | 107,600 | | | 289,700 |
| PROJECT ADMINISTRATION | | | | | | | | | |
| Construction Inspection | | | 20,500 | 20,500 | - | - | | | 20,500 |
| Other | | | 21,000 | 21,000 | 1,000 | 1,000 | | | 22,000 |
| SUBTOTAL Administration for Structural Measures | | | 41,500 | 41,500 | 1,000 | 1,000 | | | 42,500 |
| TOTAL PROJECT COST 3/ | | | 223,600 | 223,600 | 108,600 | 108,600 | | | 332,200 |
| TOTAL ALL COSTS | | | 223,600 | 223,600 | 161,000 | 161,000 | | | 384,600 |

1/ Price base 1978

2/ Type of channel before project: none or practically no define channel

3/ Excludes ongoing program - Land Treatment

September 1979

TABLE 2 - ESTIMATED STRUCTURE COST DISTRIBUTION

PAW PAW BOTTOMS WATERSHED PLAN

(Dollars) 1/

| Item | Installation cost PL-566 | | | Installation Cost - Other Funds | | | Total Instal. Cost |
|------------------------|--------------------------|------------------|-----------------|---------------------------------|----------------|----------------|--------------------------|
| | Constr- uction | Engin- eering | Total PL-566 | Constr- uction | Land Rights | Total Other | |
| Flood Prevention | 133,800 | 14,500 | 148,300 | - | - | - | 148,300 |
| Land Drainage | 27,800 | 6,000 | 33,800 | 27,800 | - | 27,800 | 61,600 |
| Bridges | - | - | - | - | 19,800 | 19,800 | 19,800 |
| Landrights | - | - | - | - | 60,000 | 60,000 | 60,000 |
| Subtotal | 161,600 | 20,500 | 182,100 | 27,800 | 79,800 | 107,600 | 289,700 |
| Project Administration | - | - | 41,500 | - | - | 1,000 | 42,500 |
| GRAND TOTAL | 161,600 | 20,500 | 223,600 | 27,800 | 79,800 | 108,600 | 332,200 |

1/ Price base 1978

September 1979

TABLE 2A - COST ALLOCATION AND COST SHARING SUMMARY

PAW PAW BOTTOMS WATERSHED PLAN

(Dollars) ^{1/}

| ITEM | COST ALLOCATION | | | | COST SHARING | | | | | | | |
|--------------------|-----------------------|--------------------|---------|--|-----------------------|--------------------|---------|--|-----------------------|--------------------|---------|--|
| | | | | | | | | | | | | |
| | PURPOSE | | | | PL-566 | | | | OTHER | | | |
| | Flood : Prevention | Land : Drainage | Total | | Flood : Prevention | Land : Drainage | Total | | Flood : Prevention | Land : Drainage | Total | |
| Construction | 133,800 | 55,600 | 189,400 | | 133,800 | 27,800 | 161,600 | | - | 27,800 | 27,800 | |
| Engineering | 14,500 | 6,000 | 20,500 | | 14,500 | 6,000 | 20,500 | | - | - | - | |
| Bridge Replacement | 14,000 | 5,800 | 19,800 | | - | - | - | | 14,000 | 5,800 | 19,800 | |
| Landrights | 42,400 | 17,600 | 60,000 | | - | - | - | | 42,400 | 17,600 | 60,000 | |
| GRAND TOTAL | 204,700 | 85,000 | 289,700 | | 148,300 | 33,800 | 182,100 | | 56,400 | 51,200 | 107,600 | |

^{1/} Price Base 1978

September 1979

TABLE 3 - STRUCTURE DATA
CHANNELS

PAW PAW BOTTOMS WATERSHED PLAN

| Channel (no. or Reach | Station | Drainage Area : Sq. Mi. : | Capacity : cfs. : | Water Surface Elevation : (ft.-msl.) : | Hydraulic Gradient : (ft./ft.) : | Channel Dimensions | | | Side Slopes | "n" Value | | Maximum Velocities | | Excavation Cy. Yds. |
|------------------------------|---------|---------------------------------|----------------------|---|--|---------------------------|--------------------|-----------------------------|----------------|-----------|----------|--------------------|----------|------------------------|
| | | | | | | Gradient : (ft./ft.) : | Width : (ft.) : | Elevation : (ft./msl.) : | | Aged | As Built | Aged | As Built | |
| | | | | | | | | | | | | | | |
| Main #1 (North Main) | 93+00 | 2.56 | 157 | 411.9 | .0002 | 0.0003 | 20 | 407.6 | 1.5:1 | 0.04 | 0.022 | 1.40 | 1.85 | 23,829 |
| | 75+00 | 2.56 | 157 | 412.3 | .0002 | 0.0003 | 20 | 408.1 | 1.5:1 | 0.04 | 0.022 | 1.40 | 1.85 | |
| | 66+00 | 1.89 | 116 | 412.6 | .0003 | 0.0003 | 14 | 408.4 | 1.5:1 | 0.04 | 0.022 | 1.36 | 1.88 | |
| | 55+00 | 1.75 | 108 | 412.9 | .0003 | 0.0003 | 14 | 408.7 | 1.5:1 | 0.04 | 0.022 | 1.27 | 1.83 | |
| | 40+00 | 0.70 | 43 | 413.2 | .0002 | 0.00067 | 8 | 409.7 | 1.5:1 | 0.04 | 0.022 | 0.95 | 1.53 | |
| | 19+00 | 0.47 | 29 | 413.7 | .0002 | 0.00067 | 6 | 411.1 | 1.5:1 | 0.04 | 0.022 | 1.19 | 1.88 | |
| | 0+00 | 0.25 | 15 | 414.6 | .0005 | 0.00067 | 4 | 412.4 | 1.5:1 | 0.04 | 0.022 | 0.95 | 1.69 | |
| Main #2 (South Main) | 125+00 | 4.12 | 253 | 413.6 | .00035 | 0.00056 | 24 | 407.6 | 1.5:1 | 0.04 | 0.022 | 1.69 | 2.5 | 84,320 |
| | 78+50 | 4.12 | 253 | 415.3 | .00035 | 0.00056 | 24 | 410.2 | 1.5:1 | 0.04 | 0.022 | 1.69 | 2.5 | |
| | 52+80 | 3.22 | 198 | 416.2 | .00035 | 0.00056 | 24 | 411.6 | 1.5:1 | 0.04 | 0.022 | 1.48 | 2.3 | |
| | 26+40 | 1.55 | 95 | 417.1 | .00035 | 0.00056 | 10 | 413.1 | 1.5:1 | 0.04 | 0.022 | 1.66 | 2.47 | |
| | 0+00 | 0.57 | 35 | 418.0 | .00035 | 0.00056 | 2 | 414.6 | 1.5:1 | 0.04 | 0.022 | 1.37 | 2.16 | |
| Lateral 2A | 86+00 | 1.10 | 68 | 415.2 | .00038 | 0.00067 | 8 | 411.1 | 1.5:1 | 0.04 | 0.022 | 1.58 | 2.1 | 22,280 |
| | 60+00 | 1.10 | 68 | 416.2 | .00038 | 0.0007 | 8 | 412.8 | 1.5:1 | 0.04 | 0.022 | 1.58 | 2.1 | |
| | 33+50 | 0.84 | 52 | 417.6 | .00055 | 0.0007 | 8 | 414.7 | 1.5:1 | 0.04 | 0.022 | 1.49 | 2.26 | |
| | 23+00 | 0.59 | 36 | 418.4 | .00076 | 0.0007 | 8 | 416.1 | 1.5:1 | 0.04 | 0.022 | 1.31 | 1.94 | |
| | 11+00 | 0.34 | 21 | 419.1 | .00058 | 0.0007 | 4 | 417.0 | 1.5:1 | 0.04 | 0.022 | 1.22 | 1.89 | |
| | 0+00 | 0.13 | 8 | 419.5 | .00036 | 0.0007 | 4 | 417.8 | 1.5:1 | 0.04 | 0.022 | 1.72 | 1.19 | |
| Lateral 2B (West Segment) | 40+00 | 1.54 | 95 | 413.4 | .0003 | 0.0003 | 16 | 409.8 | 1.5:1 | 0.04 | 0.022 | 1.23 | 1.83 | 23,653 |
| | 26+70 | 1.54 | 95 | 413.8 | .0003 | 0.0003 | 6 | 410.2 | 1.5:1 | 0.04 | 0.022 | 1.23 | 1.83 | |
| | 0+00 | 0.63 | 39 | 414.6 | .0003 | 0.0603 | 6 | 411.0 | 1.5:1 | 0.04 | 0.022 | 1.07 | 1.60 | |
| Lateral 2B | 26+70 | 0.91 | 56 | 410.6 | .0008 | 0.0008 | 6 | 413.8 | 1.5:1 | 0.04 | 0.022 | 1.67 | 2.50 | |
| | 0+00 | 0.91 | 56 | 412.7 | .0008 | 0.0008 | 6 | 415.9 | 1.5:1 | 0.04 | 0.022 | 1.67 | 2.50 | |
| Lateral 2C | 59+10 | 0.86 | 53 | 414.1 | .0004 | 0.00066 | 12 | 411.2 | 1.5:1 | 0.04 | 0.022 | 1.20 | 1.77 | 5,000 |
| | 44+00 | 0.70 | 43 | 414.6 | .0004 | 0.00066 | 12 | 413.4 | 1.5:1 | 0.04 | 0.022 | 1.10 | 1.87 | |
| | 25+00 | 0.55 | 34 | 415.4 | .0004 | 0.00066 | 12 | 413.6 | 8:1 | 0.04 | 0.022 | 0.87 | 1.23 | |
| | 0+00 | 0.23 | 14 | 416.4 | .0004 | 0.00066 | 12 | 415.2 | 8:1 | 0.04 | 0.022 | 0.65 | 0.94 | |

September 1973

TABLE 3A - STRUCTURAL DATA
GRADE STABILIZATION STRUCTURES
PAW PAW BOTTOMS WATERSHED PLAN

| Site No. | Drainage Area (Sq. Mi.) | Drop (Feet) | Concrete (Cu. Yds.) | Type of Structure |
|-------------------------------|-------------------------------|----------------|------------------------|---|
| 1 Sta. 125+00 Main #2 | 4.12 | 8.6 | | Pipe Overfall 2-72" CMP w/Rip Rap Protection |
| 2 Sta. 86+00 Lateral 2A | 1.10 | 2.9 | | Pipe Overfall 1-48" CMP w/standard end section entrance |
| 3 Sta. 59+10 Lateral 2C | 0.90 | 4.3 | 1.5 | Pipe Drop 42" CMP Barrel w/48" CMP Riser |

September 1979

TABLE 4 - ANNUAL COSTS
PAW PAW BOTTOMS WATERSHED PLAN

(Dollars) 1/

| Evaluation Unit | Amortization of Installation Cost <u>2/</u> | Operation and Maintenance Cost | Total <u>3/</u> |
|--|---|--------------------------------------|-----------------|
| Channel Work: Channels Main #1, #2; Laterals 2A, 2B, and 2C; Grade Stabilization Structures 1,2 and 3 | 20,660 | 1,150 | 21,810 |
| Project Administration | 3,030 | | 3,030 |
| Grand Total | 23,690 | 1,150 | 24,840 |

1/ Price base - Installation 1978, O&M 1978

2/ 50 years @ 6 7/8 percent interest

3/ Annual costs of \$4,060, including \$500 for operation and maintenance for onfarm associated measures are not included

September 1979

TABLE 5 - ESTIMATED AVERAGE ANNUAL FLOOD DAMAGE REDUCTION BENEFITS

PAW PAW BOTTOMS WATERSHED PLAN

(Dollars) 1/

| Item | <u>Estimated Average Annual Damage</u> | | Damage Reduction Benefits <u>2/</u> |
|-------------------------|--|---------------------|---|
| | <u>Without Project</u> | <u>With Project</u> | |
| Crop and Pasture Damage | 80,670 | 26,520 | 54,150 |
| Total | 80,670 | 26,520 | 54,150 |

1/ Price base - current normalized prices (October 1978)2/ Includes the effect of associated onfarm measures

September 1979

TABLE 6 - COMPARISON OF BENEFITS AND COSTS
PAW PAW BOTTOMS WATERSHED PLAN
(Dollars)

| Evaluation Unit | Damage Reduction Benefits | Average Annual Benefits 1/2/ | | Average Annual Cost 3/ | Benefit Cost Ratio |
|---|------------------------------|------------------------------|--------|------------------------------|--------------------------|
| | | Drainage | Total | | |
| Multi-purpose channel Main #1 and #2 Laterals 2A, 2B, 2C Grade Stabilization Structures 1,2 and 3 | 46,545 | 19,320 | 65,865 | 21,810 | 3.0:1 |
| Project administration | | | | 3,030 | |
| Grand Total | 46,545 | 19,320 | 65,865 | 24,840 | 2.7:1 |

1/ Price base - Current normalized prices (October 1978)

2/ In addition it is estimated that onfarm drainage measures will provide \$10,760 of annual benefits

3/ From table 4

September 1979

Appendix A

AGREEMENT

AGREEMENT

between the following local organizations:

Sequoyah County Conservation District

Paw Paw Conservancy District

Cherokee Hills Resource Conservation and Development Project, Incorporated

(referred to herein as Sponsors)

State of Oklahoma

and the

Soil Conservation Service
United States Department of Agriculture
(referred to herein as SCS)

Whereas, application has heretofore been made to the Secretary of Agriculture by the sponsors for assistance in preparing a plan for works of improvement for the Paw Paw Bottoms Watershed, State of Oklahoma, under the authority of the Watershed Protection and Flood Prevention Act (16 U.S.C. 1001-1008), and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended, has been assigned by the Secretary of Agriculture to the Soil Conservation Service (SCS); and

Whereas, there has been developed through the cooperative efforts of the sponsors and the SCS this plan for works of improvement for the Paw Paw Bottoms Watershed, State of Oklahoma; and

Now, therefore, in view of the foregoing considerations, the Secretary of Agriculture, through the SCS and the sponsors, hereby agree on this plan and that the works of improvement for this project will be installed, operated, and maintained in accordance with the terms, conditions, and stipulations provided for in this watershed plan and including the following:

1. The Sponsors will acquire, with other than PL 566 funds, such land-rights as will be needed in connection with the works of improvement. (Estimated Cost \$79,800.)

2. The Sponsors assure that comparable replacement dwellings will be available for individuals and persons displaced from dwellings, and will provide relocation assistance advisory services and relocation assistance, make the relocation payments to displaced persons, and otherwise comply with the real property acquisition policies contained in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 1894) effective as of January 2, 1971, and the Regulations issued by the Secretary of Agriculture pursuant thereto. The costs of relocation payments will be shared by the Sponsors and SCS as follows:

| | <u>Sponsors</u> (percent) | <u>SCS</u> (percent) | <u>Estimated Relocation Payment Costs</u> (dollars) |
|---------------------|------------------------------|-------------------------|--|
| Relocation Payments | 32.7 | 67.3 | 0 ^{1/} |

3. The Sponsors will acquire or provide assurance that landowners or water users have acquired such water rights pursuant to state law as may be needed in the installation and operation of works of improvement.

4. The percentages of construction costs to be paid by the Sponsors and by SCS are as follows:

| <u>Works of Improvement</u> | <u>Sponsors</u> (percent) | <u>SCS</u> (percent) | <u>Estimated Construction Costs</u> (dollars) |
|---------------------------------|------------------------------|-------------------------|--|
| Channel Work | 14.7 | 85.3 | 189,400 |

5. The percentages of the engineering costs to be borne by the Sponsors and SCS are as follows:

| <u>Works of Improvement</u> | <u>Sponsors</u> (percent) | <u>SCS</u> (percent) | <u>Estimated Engineering Costs</u> (dollars) |
|---------------------------------|------------------------------|-------------------------|---|
| Channel Work | 0 | 100 | 20,500 |

^{1/} Investigation has disclosed that under present conditions the project measures will not result in the displacement of any person, business, or farm operation. However, if relocations become necessary, relocation payments will be cost shared in accordance with the percentages shown.

6. The Sponsors and SCS will each bear the costs of Project Administration which it incurs, estimated to be \$1,000 and \$41,500, respectively.

7. The Sponsors will encourage landowners and operators to operate and maintain the resource management systems and associated onfarm measures for the protection and improvement of the watershed.

8. The Sponsors will be responsible for the operation, maintenance, and replacement of the works of improvement by actually performing the work or arranging for such work in accordance with agreements to be entered into prior to issuing invitations to bid for construction work.

9. The costs shown in this plan represent preliminary estimates. In finally determining the costs to be borne by the parties hereto, the actual costs incurred in the installation of works of improvement will be used.

10. This agreement is not a fund obligating document. Financial and other assistance to be furnished by SCS in carrying out the plan is contingent upon the fulfillment of applicable laws and regulations and the availability of appropriations for this purpose.

11. A separate agreement will be entered into between SCS and the Sponsors before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

12. This plan may be amended, revised, or terminated only by mutual agreement of the parties hereto except that SCS may terminate financial and other assistance in whole, or in part, at any time it determines that the Sponsors have failed to comply with the conditions of this agreement. In this case, SCS shall promptly notify the Sponsors, in writing, of the determination and the reasons for the termination, together with the effective date. Payments made to the Sponsors or recoveries by SCS under projects terminated shall be in accord with the legal rights and liabilities of the parties.

13. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this plan, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

14. The program conducted will be in compliance with all requirements respecting nondiscrimination as contained in the Civil Rights Act of 1964, as amended, and the regulations of the Secretary of Agriculture (7 CFR 15.1-15.12), which provide that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any activity receiving federal financial assistance.

Paw Paw Conservancy District

By _____

Title _____

Address _____

Zip Code _____

Date _____

The signing of this plan was authorized by a resolution of the governing
body of the _____ Paw Paw Conservancy District
adopted at a meeting held on _____

Address _____

Zip Code _____

Date _____

Sequoyah County Conservation District

By _____

Title _____

Address _____

Zip Code _____

Date _____

The signing of this plan was authorized by a resolution of the governing
body of the _____ Sequoyah County Conservation District
adopted at a meeting held on _____

Address _____

Zip Code _____

Date _____

Cherokee Hills Resource Conservation
and Development Project, Incorporated

By _____

Title _____

Address _____

Zip Code _____

Date _____

The signing of this plan was authorized by a resolution of the governing
body of the Cherokee Hills Resource Conservation and Development
Project, Incorporated adopted at a meeting held on _____

Address _____

Zip Code _____

Date _____

Appropriate and careful consideration has been given to the environmental
impact statement prepared for this project and to the environmental
aspects thereof.

Soil Conservation Service
United States Department of Agriculture

Approved by:

Roland Willis
State Conservationist

Appendix B

SOILS DATA

SOILS DATA

Bottomland soils in the project area:

Crevasse soils, 0 to 3 percent slopes (76 acres). These soils are deep, sandy, rapidly permeable, somewhat excessively drained. The slopes are short and irregular. Included are small areas of fine sandy loam and Yahola fine sandy loam.

Latanier clay, 0 to 1 percent slopes (243 acres). These are deep, moderately well drained to somewhat poorly drained soils. Permeability is very slow in the surface layer but moderate in the substratum. Included are small areas of Miller clay and Lonoke silty clay loam.

Lela clay, 0 to 1 percent slopes (28 acres). These are deep, very slowly permeable, somewhat poorly drained soils. Included are small areas of Muldrow silty clay loam.

Lonoke loam, nearly level (1022 acres). This is deep moderately permeable to moderately slowly permeable, well drained soil. Included are small areas of Lonoke silty clay loam and Robinsonville fine sandy loam.

Lonoke silty clay loam, level (733 acres). This is deep, moderately slowly permeable, well drained soil. Included are small areas of Lonoke loam, nearly level.

Lonoke silty clay loam, undulating (35 acres). This is deep, moderately slowly permeable, well drained soil. It occurs on short irregular shaped areas of Latanier clay.

Miller clay, 0 to 1 percent slopes (60 acres). This is deep, very slowly permeable, somewhat poorly drained soil. Included are small areas of Latanier clay, Miller silty clay loam, and Lonoke silty clay loam.

Miller silty clay loam, 0 to 1 percent slopes (289 acres). This is deep, very slowly permeable, somewhat poorly drained soil. Included are small areas of Latanier clay, Miller clay, and Lonoke silty clay loam.

Muldrow silty clay loam, 0 to 1 percent slopes (99 acres). This is deep, very slowly permeable somewhat poorly drained soil. Included are small areas of Lela clay and Brewer silty loam.

Robinsonville fine sandy loam, level (95 acres). This is deep, moderately rapidly permeable, well drained soil. Included are small areas of Yahola fine sandy loam and Lonoke loam, level.

Robinsonville fine sandy loam, undulating (294 acres). This is deep, moderately rapidly permeable, well drained soil. It occurs on short irregular slopes of 1 to 3 percent. Included are small areas of Yahola fine sandy loam and Lonoke loam, nearly level.

Yahola fine sandy loam, 0 to 3 percent slopes (790 acres). This is deep, moderately rapidly permeable, well drained soil. The slopes are short and irregular. Included are small areas of Crevasse soils.

Yahola complex, 0 to 2 percent slopes (266 acres). This complex consists of Yahola soils and soils that have a subsurface layer of clay. The Yahola soils are underlain by calcareous clay at a depth of 30 to 50 inches. Soils that are similar, but have a clay layer at 12 to 30 inches deep, make up nearly 50 percent of this complex.

A more detailed description of these soils can be obtained in the Sequoyah County Soil Survey.

DISPLAY ACCOUNTS FOR THE SELECTED ALTERNATIVE

National Economic Development

Environmental Quality

Regional Development

Social Well-Being

SELECTED ALTERNATIVE

NATIONAL ECONOMIC DEVELOPMENT ACCOUNT

PAW PAW BOTTOMS WATERSHED PLAN

| <u>Components</u> | | <u>Measures of Effect</u> | <u>Components</u> | <u>Measures of Effects</u> |
|--|---------------------|----------------------------|---|----------------------------|
| Beneficial Effects: | | Average Annual <u>1/2/</u> | Adverse Effects: | Average Annual <u>1/2/</u> |
| A. The values to users of increased output of goods and services | 1. Flood Prevention | 54,150 | A. The value of resources required for a plan | |
| | 2. Drainage | 22,475 | 1. Multipurpose channel serving flood prevention and drainage | |
| | | | a. project installation | 20,660 |
| | | | b. operation & maintenance | 1,150 |
| | | | c. project administration | 3,030 |
| | | | 2. On-farm associated drainage measures | |
| | | | a. land treatment | 3,560 |
| | | | b. operation and maintenance | 500 |
| Total Beneficial Effect | | 76,625 | | |
| Net Beneficial Effect | | 51,785 | Total Adverse Effect | 28,900 |

1/ 50 years @ 6 7/8 percent interest

2/ Price base - current normalized (October 1978) for beneficial effects
1978 costs for adverse effects

SELECTED ALTERNATIVE
ENVIRONMENTAL QUALITY ACCOUNT
PAW PAW BOTTOMS WATERSHED PLAN

| <u>Components</u> | <u>Measures of Effects</u> |
|--|---|
| Beneficial and Adverse Effects: | |
| A. Acres of natural beauty | 1. Project output will make available regional fund that can be used to enhance the physical appearance of farms. |
| B. Quality consideration | 1. Increase and protect the agricultural productivity of 1,310 acres of bottomland soils. 2. Eliminate vector breeding ground by providing outlet for small depressed areas inundated by floodwater. 3. Provide more efficient use of 3,000 acres of prime farmland. 4. Provide opportunity for reduced water pollution. 5. Temporary disturbance of soils during project installation. |
| C. Biological resources and selected eco-systems | 1. Identification and avoidance of damage to 40 acres type 6 wetlands. 2. Conversion of 40 acres of low quality forest land to other uses. |
| D. Irreversible or irretrievable commitments | 1. 35 acres of prime farmland committed to channel for the life of the project. 2. Temporary increase in pollution during construction. |

THE
HISTORY OF THE
UNITED STATES OF AMERICA

BY

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JOHN

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REGIONAL DEVELOPMENT ACCOUNT

PAW PAW BOTTOMS WATERSHED, OKLAHOMA

| | <u>Components</u> <u>Income</u> | <u>Measures of Effects</u> | | <u>Components</u> <u>Income</u> | <u>Measures of Effects</u> | |
|--|------------------------------------|-------------------------------|-------------------------------|------------------------------------|-------------------------------|-------------------------------|
| | | <u>Okla</u> | <u>Rest of Nation</u> | | <u>Okla</u> | <u>Rest of Nation</u> |
| | | (average annual dollars) 1/2/ | (average annual dollars) 1/2/ | | (average annual dollars) 1/2/ | (average annual dollars) 1/2/ |

Beneficial Effects:

A. The value of increase output of goods and services to users residing in the area

1. Flood Prevention
2. Drainage
3. The utilization of regional unemployed labor resources

a. Project construction

B. The value of output to users residing in the region from pecuniary external economics

1. Indirect activities associated with increased net returns from flood prevention and drainage

Total beneficial effect

105,195

0

Total Adverse Effect
Net Beneficial Effect

12,955
76,295

15,945

Adverse Effects:

A. The value of resources contributed from within the region to achieve output

1. Multipurpose channel serving flood prevention and drainage

a. Project installation
b. O&M
c. Project adm.

2. Associated on-farm drainage measures

a. Project installation
b. O&M

12,985
0
2,960

7,675
1,150
70

12,985
0
2,960

1/ 50 years @ 6 7/8 percent interest
2/ Price base - current normalized for beneficial effects, 1978 for adverse effects

SELECTED ALTERNATIVE

REGIONAL DEVELOPMENT ACCOUNT (Continued)

PAW PAW BOTTOMS WATERSHED PLAN

| | <u>Components Employment</u> | <u>Measures of Effects</u> | | <u>Components Employment</u> | <u>Measures of Effects</u> | |
|--|--|----------------------------|-----------------------|----------------------------------|----------------------------|-----------------------|
| | | <u>Oklahoma</u> | <u>Rest of Nation</u> | | <u>Oklahoma</u> | <u>Rest of Nation</u> |
| Beneficial Effects: | | | | | | |
| A. Increase in number and type of jobs | | | | A. Decrease in number | 0 | 0 |
| 1. Agricultural employment | 11 permanent semi-skilled | 0 | | | | |
| 2. Employment for project construction | 4 semi-skilled for 1 year | 0 | | | | |
| 3. O&M | 0 | 0 | | | | |
| 4. Indirect & induced employment for (1) output project goods & service (2) project construction | 6 | 0 | | | | |
| Total Beneficial Effects | 17 permanent semi-skilled 7 semi-skilled for 1 year | 3 | 0 | Total Adverse Effects | 0 | 0 |

SELECTED ALTERNATIVE
REGIONAL DEVELOPMENT ACCOUNT (Continued)
PAW PAW BOTTOMS WATERSHED PLAN

| <u>Components</u> | <u>Measures of Effects</u> |
|---|--|
| Population Distribution Beneficial Effects | Create 17 permanent semi-skilled jobs for rural area |
| Adverse Effectctions | |
| Regional Economic Base Beneficial | Provide protection for soils with high agricultural potential in a region where agriculture is a strong basic industry |

SELECTED ALTERNATIVE
SOCIAL WELL-BEING ACCOUNT
PAW PAW BOTTOMS WATERSHED PLAN

Components

Measures of Effects

Beneficial and Adverse Effects:

- A. Real income distribution
1. Create 17 low to medium income jobs
 2. Create income distribution of \$76,625 among farms classed according to market value of agricultural products sold as follows:

| <u>Farms by Value of sales</u> | <u>% of sales by class</u> | <u>% of benefits by class</u> |
|------------------------------------|--------------------------------|-----------------------------------|
| Less than 2,000 | 9.5 | 57.9 |
| 2,000 - 20,000 | 32.8 | 34.6 |
| Greater than 20,000 | 57.7 | 7.4 |

Appendix D

PROJECT MAP



39 14 00m N.

39 12 00m N

39 10 00m N

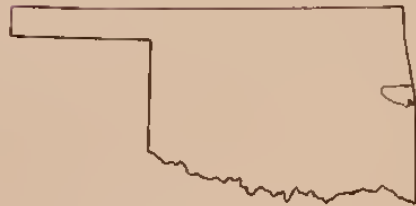


BASE LEGEND

- TOWN
- IMPROVED ROAD
- UNIMPROVED ROAD
- CEMETERY
- DRAINAGE
- WATERSHED BOUNDARY

PROJECT LEGEND

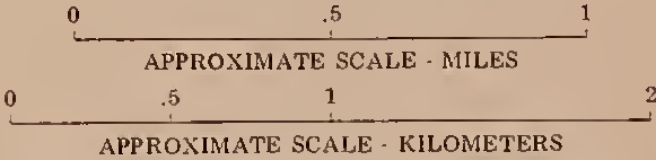
- 86+00 STATION NUMBER
- CHANNEL WORK
- BENEFITED AREA



VICINITY MAP



PROJECT MAP
**PAW PAW BOTTOMS
WATERSHED**
A PORTION OF
SEQUOYAH COUNTY
OKLAHOMA



BASE COMPILED FROM U.S.G.S. QUADRANGLE SHEETS AND OKLAHOMA COUNTY HIGHWAY MAP, POLYCONIC PROJECTION.
2,000 METER UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 15.

JULY 1979 4-R-37194

JULY 1979 BASE 4-R-37172

358 000m E. 360 000m E. 362 000m E.

